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| ***MLA header:*** | **Student:**  Student did not submit the assignment.  ***Mr. Tiénou-Gustafson & Mr. Biélmeier***  **Geometry, Period \_\_\_\_\_**  **Final Draft: Monday, 10 November 2014** | |
| **Assignment:** | Area & Perimeter Discovery (Performance Task) | |
| **Assignment Summary:** | You now know the basic concepts of perimeter & area. However, we do not yet know what the relationship between the two is, either for rectangles or triangles. Are they related? Can different rectangles (or triangles) with the same perimeter have different areas? If the perimeter doesn’t directly determine the area, what does?  We also cannot apply what we have learned directly to circles. We could make smaller and smaller rectangles or triangles within a circle to approximate its area or perimeter, but this would be very time consuming. In this exploration, you will uncover a foundational geometric fact about the perimeter of circles.  This performance task will be worth 75 points. The performance task will be broken into three tasks (circles, rectangles, and triangles) as outlined in the procedure section. | |
| **Role:** | You are writing as a mathematician. You are exploring the relationship between different measurements of circles, rectangles, and triangles, and generalizing rules about these shapes from your observations. | |
| **Audience:** | Your audience members are your teachers and fellow classmates. | |
| **Format:** | -5 points for not following these procedures:   * **All work shown *to scale* on centimeter graph paper.** * **Paragraph portion *typed*, 1-inch margins, double spaced**   (11 point Calibri or 12 point Times New Roman)   * No excessive spacing of lines or margins | -2 points for these format errors:   * Staple assignment sheet in front of your typed paper and all graph paper in the back * Indent the beginning of the paragraph * MLA format heading on both typed & graph papers |
| **Materials:** | * Centimeter graph paper (provided) – if you lose it, print your own at [teachervision.com/math/printable/6170.html](https://www.teachervision.com/math/printable/6170.html) * Area & Perimeter data table sheet (provided) * ~4 feet of string (provided) – if you lose it, you’ll have to re-start calculations with a new string. * Ruler with inches & centimeters. (If you don’t own one, buy one or print one at [printable-ruler.net](http://printable-ruler.net/)) | |
| **Procedure:** | **I. Circle Perimeter** ~ Cut your string into 3 different-sized lengths. For ***each*** string, complete these steps:   1. Measure each length & record in your chart. Give all lengths including fractions, then decimals. 2. Make a circle on a flat surface out of the string segment, making the length of the string into a perimeter. 3. Measure the diameter of each circle with a ruler (inch side). Make an erasable mark for diameter on the ruler. 4. To calculate the **visual** estimate of p/d (how long the string is in relationship to the diameter), fold the string back & forth on your ruler for the length of the diameter. Measure to 16ths of an inch, then calculate decimals. 5. To calculate the **algebraic** estimate of p/d, divide the perimeter (string length) by the diameter of the circle. 6. Use the averages of p/d to create a formula for perimeter. 7. Draft & type ¶1 answering this: ***What appears to be the relationship of the diameter of any circle, regardless of size, to its perimeter? What formula can be derived from your observations?***   **II. Rectangle Area & Perimeter** ~ Pick **one** of your three strings and complete these steps ***3 times*** (same string):   1. Create a rectangle. Draw & label your rectangle on centimeter graph paper. (3 rectangles on the same sheet.) 2. Measure & label the length & width on graph paper, then record in your chart. 3. Repeat with same string, creating 2 different rectangles. Make one a square, or close to it. 4. Calculate the area of your rectangle. 5. Draft & type ¶2 answering this: ***Is there a relationship between perimeter & area of a rectangle? If so, what is it? If not, what characteristic(s) produce(s) the greatest area for a rectangle of any given perimeter?***   **III. Triangle Area & Perimeter** ~ Use the **same** string as in part II to complete these steps ***3 times*** (same string):   1. Create a triangle. Draw & label your rectangle on centimeter graph paper. 2. Add a height line (if needed) by dropping a dotted line from the top vertex to the base, forming a right angle. 3. Measure & label the base & height on graph paper, then record the in your chart. 4. Repeat with same string, creating 2 different triangles with the same base. Make one triangle a **right triangle**, one an **acute triangle** (all angles <90°), and one an **obtuse triangle** (one angle >90°). Label each with the type. 5. Calculate the area of each triangle. 6. Draft & type ¶3 answering this: ***Is there a relationship between perimeter & area of a triangle? If so, what is it? If not, what characteristic(s) produce(s) the greatest area for a triangle of any given perimeter?***   **IV. Submission Details:**   1. Print your **final draft** & submit it in class. **(due Mon, 10 Nov 2014).**  * ***If you are absent****, email paper to your teacher(s) (*[*dtg@noblenetwork.org*](mailto:dtg@noblenetwork.org)*,* [*sbielmeier@noblenetwork.org*](mailto:sbielmeier@noblenetwork.org)*)  by 8am on the due date or it will be considered late.*  1. **Submit** your typed paper portion on [**www.turnitin.com**](http://www.turnitin.com). (due 10 Nov ***before* 7:50am**). | |

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| **Category** | | **A – Exceeding**  (9-10/10 or 5/5) | **B - Meeting**  (8/10 or 4/5) | **C - Approaching**  (7/10 or 3.5/5) | **D - Baseline**  (6/10 or 3/5) | **F – Unacceptable**  (0-5/10 or 0-2.5/5) | **Points:** |
| **I. Circles** | **Data Set** | * All perimeter & diameter lengths match (fraction to decimal) to hundredths. * All diameter measures are reasonable to perimeter. * All visual and algebraic estimates within 1/10 length & within .5 of each other. | * Most perimeter & diameter lengths match, at least to tenths. * Diameter measures are fairly reasonable (≤⅓ perimeter). * All visual and algebraic estimates within 1 inch of each other. | * Most perimeter & diameter lengths match, at least to inches. * Most diameter measures are reasonable. * All visual and algebraic estimates within 1 inch of each other. | * Perimeter & diameter are in fraction & decimal. * Diameter measures are <½ perimeter. * Algebraic estimates are within 1 point of correct answer. | * Perimeter & diameter both given. * Diameter measures are < perimeter. * Algebraic estimates are significantly different (>1 point) | \_\_\_\_\_\_/10 |
| **Formula** | * Average is reasonable. * Formula is accurate. | * Formula is accurate for the average given. | * Formula is accurate for the average given. | * Some algebra errors or * is used, not average | * Significant algebraic errors. | \_\_\_\_\_\_/5 |
| **Write-up** | * Answers questions thoroughly * Mathematical terminology used accurately throughout. * Accurate conclusions drawn about diameter & perimeter. * 0-1 convention mistakes. | * Answers questions correctly. * Mathematical terminology generally used. * Draws conclusions about diameter & perimeter. * 2-3 convention mistakes. | * All questions answered. * Academic terminology generally used. * Some conclusions about diameter & perimeter. * 4-5 convention mistakes. | * Most questions answered. * Some informal language. * Addresses diameter & perimeter. * 5-7 convention mistakes. | * Some questions not addressed. * Informal language. * ≥8 convention mistakes. | \_\_\_\_\_\_/10 |
| **II. Rectangles** | **Data Set** | * Centimeter measurements. * All rectangles have same perimeter, and length & width add up to perimeter. * Formula is correct. * All areas correctly calculated. | * Centimeter measurements. * All rectangles have same perimeter, and most have reasonable measures. * Formula is correct. * Most areas correctly calculated. | * All rectangles have same perimeter, and most have reasonable measures. * Formula is correct. * Few calculation errors. | * Most rectangles have reasonable measures. * Formula may be absent or incorrect. * Some area calculation errors. | * All rectangle measures given. * Significant area calculation errors. | \_\_\_\_\_\_/10 |
| **Graph Paper** | * All rectangles are drawn **to scale** on graph paper. * All rectangles labeled fully. | * All rectangles are drawn **to scale** on graph paper. * Rectangles are labeled. | * All rectangles are drawn **to scale** on graph paper. * Rectangles are labeled. | * All rectangles are drawn on graph paper, but not to scale (centimeters) | * Shapes are drawn, but may not be accurate. | \_\_\_\_\_\_/5 |
| **Write-up** | * Answers questions thoroughly * Mathematical terminology used accurately throughout. * Accurate conclusions drawn about diameter & perimeter. * 0-1 convention mistakes. | * Answers questions correctly. * Mathematical terminology generally used. * Draws conclusions about diameter & perimeter. * 2-3 convention mistakes. | * All questions answered. * Academic terminology generally used. * Some conclusions about area of a rectangle. * 4-5 convention mistakes. | * Most questions answered. * Some informal language. * Addresses area of a rectangle. * 5-7 convention mistakes. | * Some questions not addressed. * Informal language. * ≥8 convention mistakes. | \_\_\_\_\_\_/10 |
| **III. Triangles** | **Data Set** | * Centimeter measurements. * All triangles have same perimeter and reasonable base & height lengths. * Formula is correct. * All areas correctly calculated. | * Centimeter measurements. * All triangles have same perimeter and most have reasonable base & height. * Formula is correct. * All areas correctly calculated. | * All triangles have same perimeter and most have reasonable base & height. * Formula is correct. * Few calculation errors. | * Most triangles have reasonable measures. * Formula may be absent or incorrect. * Some area calculation errors. | * All triangle measures given. * Significant area calculation errors. | \_\_\_\_\_\_/10 |
| **Graph Paper** | * All triangles are drawn **to scale** on graph paper. * All triangles labeled fully. | * All triangles are drawn **to scale** on graph paper. * Triangles are labeled. | * All triangles are drawn **to scale** on graph paper. * Triangles are labeled. | * All triangles are drawn on graph paper. | * Shapes are drawn, but may not be accurate. | \_\_\_\_\_\_/5 |
| **Write-up** | * Answers questions thoroughly * Mathematical terminology used accurately throughout. * Accurate conclusions drawn about diameter & perimeter. * 0-1 convention mistakes. | * Answers questions correctly. * Mathematical terminology generally used. * Draws conclusions about diameter & perimeter. * 2-3 convention mistakes. | * All questions answered. * Academic terminology generally used. * Some conclusions about area of a triangle. * 4-5 convention mistakes. | * Most questions answered. * Some informal language. * Addresses area of a triangle. * 5-7 convention mistakes. | * Some questions not addressed. * Informal language. * ≥8 convention mistakes. | \_\_\_\_\_\_/10 |
|  |  | | | **Total Score:** \_\_\_\_\_\_\_\_\_\_ /75 = \_\_\_\_\_\_\_\_\_\_ % | | | |